

Literature Review: Effect of Delayed Cord Clamping on Neonatal Hemoglobin Levels

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Article Info	Abstract
Article History Submitted, 2026-05-13 Accepted, 2026-06-24 Published, 2026-06-30	Delayed cord clamping (DCC) is a simple intervention recommended in labor and delivery to improve the hematological status of newborns. Premature cord clamping can inhibit blood transfusion from the placenta to the baby, potentially reducing hemoglobin levels. This literature review aims to analyze the effect of delayed cord clamping on newborn hemoglobin levels based on variations in delay time and the underlying physiological mechanisms. Desain a literature review method. A systematic search was conducted using Google Scholar, PubMed, ScienceDirect, and ProQuest, searching for articles published between 2021 and 2025. Of the 15 articles searched, eight matched the topic of this literature review. Only articles with a quantitative design and full text were included in this analysis. Key data were searched using the PICO (Population Intervention Compare Outcome) technique. Results of this study was the eight articles demonstrated that delayed cord clamping for 1–3 minutes to more than 180 seconds significantly improved hemoglobin and hematocrit levels compared to immediate clamping. A 2-minute delay in cord clamping has also been shown to be effective in increasing hemoglobin levels in newborns. The main mechanisms underlying this increase are placental transfusion, increased blood volume, and an increase in the number of red blood cells, which contribute to increased iron stores. Furthermore, DCC does not significantly increase the risk of complications such as polycythemia or hyperbilirubinemia. Conclusion of this study was delayed cord clamping is an effective, safe, and recommended intervention for delivery practice to increase hemoglobin levels and prevent anemia in newborns.
Keywords: Delayed cord clamping, hemoglobin, newborn, neonatal anemia, placental transfusion	

Introduction

Newborn health is a crucial indicator of a nation's health quality, and neonatal anemia remains a common problem. Anemia in infants can impact growth and cognitive development, leading to increased morbidity and mortality. This condition is particularly prevalent in developing countries, necessitating simple, effective, and evidence-based interventions to prevent anemia early in newborns (Güner & Saydam, 2021).

One factor influencing newborn hemoglobin levels is the timing of umbilical cord clamping. Early cord clamping can hinder blood transfusion from the placenta to the baby. Physiologically, after birth, the placenta still contains some blood that can be transferred to the baby if clamping is delayed. Therefore, delayed cord clamping is an important intervention in improving the hematological status of newborns (Jaiswal et al., 2021).

Delayed cord clamping is defined as delaying cord clamping for 1–3 minutes after birth or until the umbilical cord pulsations cease. This practice allows for placental transfusion, which can increase the neonate's blood volume by 25–35 ml/kg, directly increasing hemoglobin and hematocrit levels. Thus, delayed cord clamping plays a crucial role in increasing the infant's blood reserves and tissue oxygenation (Kosińska-Kaczyńska et al., 2022).

Several studies have shown that delayed cord clamping significantly increases hemoglobin levels in newborns compared to immediate clamping. Furthermore, this intervention is associated with increased iron stores, which are essential for preventing anemia in infancy. These benefits are not only felt immediately after birth but can persist for several months after birth (Saghir et al., 2024).

Beyond the benefits to hemoglobin, delayed cord clamping also has a positive impact on the infant's overall health. Research shows that this intervention can reduce the incidence of anemia and improve neonatal health without increasing the risk of serious complications such as hyperbilirubinemia or polycythemia. Therefore, delayed cord clamping is increasingly recommended as standard practice in maternity care (Muarofah et al., 2024).

Despite this, the implementation of delayed cord clamping remains uneven across healthcare facilities. This is due to differences in policy, a lack of understanding among healthcare workers, and concerns about side effects that have not been significantly proven. However, scientific evidence shows that delayed cord clamping is a simple procedure with significant benefits for newborns (Kartini et al., 2025).

Based on this description, a comprehensive literature review is needed to analyze the effect of delayed cord clamping on newborn hemoglobin levels, specifically based on variations in delay time and the underlying physiological mechanisms. This review is expected to provide a strong scientific basis for healthcare workers in optimally implementing delayed cord clamping practices to improve newborn health.

Methods

This study used a systematic literature review to identify, evaluate, and analyze research findings on the effect of delayed cord clamping on hemoglobin levels in newborns. Articles were searched through the electronic databases Google Scholar, PubMed, ScienceDirect, and ProQuest, covering publication years 2021–2025. Keywords used in the article search included "delayed cord clamping," "hemoglobin," and "newborn." The article search and selection process used the PICO (Population, Intervention, Comparison, Outcome) approach to facilitate the identification of articles relevant to the research topic. The inclusion criteria for this study included: (1) original research article, (2) using a quantitative research design, (3) available in full text, (4) published between 2021–2025, (5) in Indonesian or English, and (6) discussing the effect of delayed cord clamping on hemoglobin levels in newborns. Meanwhile, the exclusion criteria include: (1) articles in the form of theses and dissertations, (2) literature review articles, and (3) articles that cannot be accessed in full.

Results and Discussion

A literature review was conducted on 8 selected articles. The publications ranged from 2021 to 2026. The results of the journal analysis are presented in Table 1 as follows:

Table 1. Results of Journal Analysis

No	Research	Method	Results
1.	A randomized controlled clinical trial on peripartum effects of delayed versus immediate umbilical cord clamping on term newborns (Ofojebe et al., 2021)	This study used a Randomized Controlled Trial (RCT) study type that compared treatment groups with a 1:1 ratio between delayed cord clamping (60 seconds after delivery) and immediate cord clamping (0–15 seconds), using a random sampling technique. Data analysis was conducted using the intention-to-treat principle.	At 48 hours of age, the mean hemoglobin concentration in the delayed cord clamping group was significantly higher than in the immediate group (p=0.001).
2.	Effects of delayed cord clamping at different time intervals in late preterm and term neonates: a randomized controlled trial (Chaudhary et al., 2023)	This was a parallel randomized controlled trial (RCT) with three treatment groups, involving a population of newborns (late preterm and term) with a gestational age of 34–41 weeks who did not require resuscitation. The sample size for this study was 204 neonates. The sampling technique used purposive sampling. Data analysis used the chi-square test and ANOVA.	Delaying umbilical cord clamping for 120 seconds can increase the mean hematocrit by 2%
3.	The Effect of Delayed Cord Clamping on Hemoglobin Levels in Newborns at Diah	The design used was a quasi-experimental study with a Post-Test Only Control Group Design. The population used in this study	There is a significant difference between the average hemoglobin levels in the intervention group and the

	Rosita PMB, Bogor Regency, 2022 (Ginting, 2023)	was all newborns at PMB Diah Rosita, Bogor Regency, with 35 respondents. The sampling technique was accidental sampling. Data analysis used the Independent T-Test.	control group, which means that there is an effect of Delay Cord Clamping on the hemoglobin levels of newborns (p=0.000).
4.	Effect of timing of cord clamping (early vs delayed) on hemoglobin level among newborns: an Indian study (Jafra et al., 2023)	This study used [L1.1] prospective, randomized, and controlled (randomized, case-control study) involving a population of newborns with gestational age above 34 weeks born at Chanan Devi Eye Hospital, New Delhi. The number of samples in this study was 60 newborns. The sampling technique was random sampling. Data analysis used the Student's t-test, Chi-square test, and Mann-Whitney U-test.	Hemoglobin (Hb) levels in the case group (delayed umbilical cord clamping/DCC) for 3 minutes were significantly higher than in the control group (immediate umbilical cord clamping) both at birth and 24 hours after birth (p=0.001).
5.	Effects of timing of cord clamping on neonatal hemoglobin and bilirubin levels in preterm and term infants—A prospective observational cohort study (Malik et al., 2024)	This was a prospective, observational, descriptive cohort study, involving all neonates with gestational age greater than 28 weeks born at the Department of Pediatrics and Neonatology at AIIMS Bhopal. The sample size was collected using a convenient sampling method. Data were analyzed using Chi-square, One-way ANOVA, and Dunn's post-hoc test.	Increasing the duration of cord clamping contributed to a significant increase in hemoglobin and hematocrit levels without increasing the risk of neonatal polycythemia or hyperbilirubinemia (p=0.001). Optimal benefit was seen with clamping durations of 120–180 seconds (Group C) and greater than 180 seconds (Group C).
6	Global Impact of Delayed Cord Clamping on Newborn Health (Muarofah et al., 2024)	This type of research was Quasi Experimental with a Posttest-only control design, involving a population of all babies born at the Afah Midwife Independent Practice and Wiyung Community Health Center in Surabaya. The sample size was 101 babies selected using consecutive sampling techniques, divided into two groups: the immediate umbilical cord cutting group and the delayed umbilical cord cutting group. Data analysis used the Independent T-test.	Delayed clamping significantly increased hemoglobin levels (P = 0.000) and reduced the incidence of jaundice (P = 0.010).
7	The Effectiveness of Delaying Umbilical Cord Cutting for 2 Minutes on Hemoglobin Levels in Newborns in the Delivery Room of Yowari Regional Hospital, Jayapura Regency in 2025 (Arihta et al., 2025)	This quantitative research used a quasi-experimental design and a posttest-only design with non-equivalent groups. The population of this study was all 60 babies born between December 2024 and January 2025, with 38 newborns taken by accidental sampling. The sample was divided into two groups: the experimental group and the control group, each with 19 respondents. Data analysis used a paired t-test.	There is a significant effect between the delay in cutting the umbilical cord for 2 minutes on hemoglobin levels in newborns (p=0.001)
8	Effect of Delayed Umbilical Cord Clamping on Hemoglobin and Hematocrit Levels in Newborns (Fariyasni et al., 2025)	This quasi-experimental study used a nonequivalent control group posttest-only design. The population was all newborns in the Maternity Ward of RSUDZA. The sampling technique used purposive sampling. Data analysis used an independent t-test.	Delayed umbilical cord clamping of >1-3 minutes had higher mean Hb and Ht levels (p=0.001)

Based on the analysis of eight articles conducted by researchers, the following results were obtained:

The Duration of Delayed Cord Clamping (DCC) on Hemoglobin Levels

Based on the analysis of eight research articles, Delayed Cord Clamping (DCC) consistently showed a positive association with improved neonatal hematological status compared with Immediate Cord Clamping (ICC). However, the interpretation of DCC duration should be made carefully because the reviewed studies used different time intervals, designs, and outcome measurements.

Starting from a shorter delay, Ofojebe et al. (2021) reported that DCC for 60 seconds resulted in significantly higher mean hemoglobin levels at 48 hours of life compared with immediate cord clamping ($p = 0.001$). This finding indicates that placental transfusion can already provide a measurable hematological benefit within the first minute after birth. Therefore, even a relatively short delay may contribute to improved neonatal hemoglobin levels.

Longer durations of DCC appeared to provide additional hematological benefits. Chaudhary et al. (2023) found that delaying cord clamping for 120 seconds increased the mean hematocrit value by 2%. Similarly, Arihta et al. (2025) reported a significant effect of a two-minute delay on newborn hemoglobin levels ($p = 0.001$). The benefit was also observed at a longer duration, as Jafra et al. (2023) found that newborns who received DCC for three minutes had significantly higher hemoglobin levels both at birth and 24 hours after birth compared with those who underwent immediate cord clamping ($p = 0.001$).

Malik et al. (2024) further supported this pattern by showing that increased cord clamping duration was associated with significantly higher hemoglobin and hematocrit levels without increasing the risk of neonatal polycythemia or hyperbilirubinemia. In this study, the optimal benefit was observed in the 120–180 seconds group and also in the group with a delay of more than 180 seconds. Meanwhile, Fariyasni et al. (2025) reported that DCC within the range of more than one minute to three minutes resulted in higher mean hemoglobin and hematocrit levels ($p = 0.001$).

Overall, the evidence suggests that DCC is beneficial when performed for at least 60 seconds, with stronger hematological benefits generally observed when the delay is extended to two or three minutes. Nevertheless, because not all studies directly compared each duration interval using the same design, it is more appropriate to conclude that DCC within the range of 1–3 minutes, and in some studies beyond 180 seconds, can improve neonatal hemoglobin and hematocrit levels when maternal and neonatal conditions are stable.

Physiological Mechanisms and Sustainable Impact of DCC

The increase in hemoglobin levels following DCC can be explained by the mechanism of placental transfusion. During the first minutes after birth, blood continues to flow from the placenta to the newborn through the umbilical cord. This additional blood volume increases neonatal circulating blood volume and contributes to a higher number of red blood cells. Ginting (2023) reported a significant difference in mean hemoglobin levels between the DCC intervention group and the control group, indicating that delayed cord clamping has a direct effect on newborn hemoglobin status.

In addition to increasing immediate hemoglobin levels, DCC may also improve iron stores, which are important for supporting erythropoiesis during early infancy. Muarofah et al. (2024) reported that DCC significantly increased hemoglobin levels and reduced the incidence of jaundice. Arihta et al. (2025) also supported the finding that a two-minute delay had a significant effect on hemoglobin levels. These findings suggest that DCC not only provides short-term hematological benefits but may also contribute to better iron availability during the early months of life.

Adequate placental transfusion may also support physiological adaptation after birth. With increased blood volume, tissue oxygenation and organ perfusion may become more stable. This condition supports neonatal transition from intrauterine to extrauterine life and may reduce the risk of early anemia. However, the sustainable impact of DCC should still be interpreted with caution because most reviewed studies focused on hemoglobin and hematocrit levels shortly after birth, while fewer studies evaluated long-term infant outcomes.

Safety and Implications for Midwifery Practice

Safety is an important consideration in the implementation of DCC. Although DCC increases neonatal blood volume, the reviewed studies generally showed that this procedure did not increase major neonatal complications. Malik et al. (2024) reported that longer cord clamping duration, including 120–180 seconds and more than 180 seconds, improved hemoglobin and hematocrit levels without increasing the risk of neonatal polycythemia or hyperbilirubinemia. This finding helps address previous concerns that delaying cord clamping could increase the risk of excessive red blood cell volume or jaundice.

The implication for midwifery practice is that DCC should be considered as a routine component of normal birth care when both mother and newborn are clinically stable. Midwives have an important role in ensuring that cord clamping is not performed immediately without indication. They also need to educate mothers and families about the benefits of DCC, particularly its contribution to improving neonatal hemoglobin levels and reducing the risk of early iron deficiency anemia.

Given its simplicity, low cost, and potential benefit, DCC is a practical intervention that can be applied in various birth settings, including resource-limited areas. Based on the reviewed evidence, a delay of at least 60 seconds is beneficial, while a delay of around 120–180 seconds or up to three minutes may provide greater hematological advantages. Therefore, DCC should be integrated into standard operating procedures for normal delivery care, while still considering the clinical condition of the mother and newborn.

Conclusion

Based on the literature review, it can be concluded that Delayed Cord Clamping (DCC) is an effective and safe intervention for improving neonatal hematological outcomes, particularly hemoglobin and hematocrit levels. The evidence indicates that delaying cord clamping for at least 60 seconds can provide measurable benefits, while a duration of around 120–180 seconds or up to three minutes may offer greater advantages when the mother and newborn are in stable condition. Therefore, it is recommended that DCC be integrated into standard midwifery practice and normal delivery procedures, supported by clear clinical guidelines, adequate training for birth attendants, and education for mothers and families. Future research should focus on long-term neonatal outcomes, standardized DCC duration, and its implementation in different healthcare settings to strengthen evidence-based maternal and newborn care.

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